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BEFORE THE BOARD OF PATENT APPEALS

AND INTERFERENCES

Paper No. 21

Application Number: 09/497,292

Filing Date: 08/28/1998

Appellant(s): Marino, M.

John J. Murphey

For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 11/26/2002.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims

The rejection of claims 40-64 stand or fall together because appellant's brief does not include a statement that this grouping of claims does not stand or fall together and reasons in support thereof. See 37 CFR 1.192(c)(7).

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

The following is a listing of the prior art of record relied upon in the rejection of claims under appeal.

4,672,674	CLOUGH ET AL	6/9/1987
4,912,767	CHANG	4,912,767

6,289,004 MESECHER ET AL 9/11/2002

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 40-64 are rejected under 35 U.S.C. 103(a).

The rejections are hereby reproduced for convenience.

Claims 40-56, 63 and 64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Clough et al (US 4,672,674).

Regarding claims 40, 43 and 54-56, Clough discloses a system for suppressing noise signals from a signal containing both voice data and noise signals. The system comprises a first receiver operative to receive both noise and voice data (column 4 lines 12-14). The first receiver digitizes (figure 1 item 5) the voice data and noise signals. A second receiver operative to receive primarily the noise signals (column 4 lines 14-15). The sampled voice data and noise signals are stored in a storage means for storing the samples from both the first and second receivers (column 3 lines 36-37). The receivers are synchronized to one another since the two signals being obtained have the noise components being correlated (column 4 lines 1-5). The definition of synchronization is having events occur at the same time. These noise components are correlated so they occur at the same time. This allows the subtractor 12 and an adaptive filtering means to suppress the noise signals in order to extract the voice data (figure 1 and column 3 lines 31-45 and 53-57) and to yield an output signal having an enhanced signal to noise ratio (column 7, lines 53-57).

Clough discloses in the abstract, the first receiver is arranged to be close to the mouth of the user and the second receiver will be spaced apart by a distance of one up to ten cms. Clough does not specifically state what the term "close to the mouth of a user for reception of speech" but it is presumed the distance will be roughly one cm. Therefore, the distance between the microphones will be ten times the distance between the first microphone and the user.

Although Clough does not discloses receiving radiated emissions and ambient signals, Clough does disclose receiving a desired signal (the information signal) and an interfering signal (noise signal), receiving a interfering signal (noise signal) and subtracting the signals to recover the desired signal. It would have been obvious for one of ordinary skill in the art at the time of the invention to utilize this method of cancellation in any application that required the elimination of interfering signals to allow for the recovery of the desired signal.

Interference cancellation in Clough and the claimed invention take place at baseband. A demodulator is necessary in the claimed invention to get the received signal down to baseband. In Clough, it is not. The received signal of Clough is already at baseband. It would have been obvious for one of ordinary skill in the art at the time of the invention to use components available to ensure the input signal is a baseband signal when interference cancellation is to take place so the interference canceler will operate properly. A demodulator is one of those elements.

Regarding claim 41, Clough discloses a system for suppressing noise signals from a signal containing both voice data and noise signals as stated above. Clough further discloses converting the received signals into a corresponding voltage (figure 1 items 5 and 6).

Regarding claim 42, Clough discloses a system for suppressing noise signals from a signal containing both voice data and noise signals as stated above. Clough further discloses converting the received signals into a corresponding voltage (figure 1 items 5 and 6). Clough does not disclose converting the received signals into a corresponding electrical current. However, it would have been obvious for one of ordinary skill in the art at the time of the invention to convert the received signals into a corresponding electrical current. By converting the signals into electrical current, only a minimal loss of signal strength would occur to the signal while traveling along the electrical conducting cable link as compared to a greater loss in voltage form do to the resistance of the wire.

Regarding claims 44 and 45, Clough further discloses the microphones are coupled to the analog to digital converters (A/D) by and electrical conducting means (figure 1).

Regarding claim 46, Clough discloses the two microphones can be arranged in one boom arm (column 3 lines 62-64).

Regarding claims 47-49, 52, 53, 63 and 64, Clough discloses the A/D converters sample the input samples at the same frequency and are therefore synchronized (column 3 lines 14-19). It is inherent that clock signals must be transmitted to each of the A/D converters to maintain this synchronization.

Regarding claim 50, Clough discloses a plurality of microphones can be used to receive the noise signals (column 3 lines 48-52).

Regarding claim 51, Clough discloses a system for suppressing noise signals from a signal containing both voice data and noise signals as stated in paragraph 3. Clough does not

disclose the use of a plurality of microphones to receive the voice data and noise signals. However, it would have been obvious for one of ordinary skill in the art at the time of the invention to use a plurality of microphones to receive the voice data and noise signals. With more than one microphone, it is possible to receive a plurality of voice signals from more than one source and after the noise signal has been removed and with proper filtering, all of the voice signals can be recovered.

Claims 57-62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Clough et al (US 4,672,674) in view of the instant applications admitted prior art.

Regarding claims 57-62, Clough discloses a system for suppressing noise signals from a signal containing both voice data and noise signals as stated above. Clough further discloses adaptive filtering is conducted to recover an audible signal (figure 1 and column 3 lines 39-45 and 53-57). However, Clough does not disclose which adaptive algorithm is used. "The two most common classes of adaptive filter algorithms are Stochastic Gradient based algorithms and Least-square based algorithms" page 16 lines 21-23 of the instant application. It would have been obvious for one of ordinary skill in the art to use the most common types of adaptive algorithms in the adaptive filtering conducted by Clough since these types of algorithms are the most widely used.

Claims 40-56, 63 and 64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang (US 4,912,767).

Regarding claims 40, 41, 43 and 54-56, Chang discloses a system for suppressing noise signals from a signal containing both voice data and noise signals. The system comprises a first receiver operative to receive both noise and voice data (abstract) and a second receiver operative to receive primarily the noise signals (abstract). The first and second receiver are synchronized. Chang states the noise components of the received signals are correlated so they will occur at the same time (column 4, lines 44-50). The noise components will occur at the same time since any time differences will be compensated for (column 4, lines 51-56). An adaptive filtering means suppresses the noise signals in order to extract the voice data (figure 2 and abstract and column 6 lines 8-15). Chang discloses the noise signals and the voice data /noise signals inputs are received by microphones (column 5 lines 17-29) and the microphones are spaced apart some distance apart.

Although Chang does not discloses receiving radiated emissions and ambient signals, Chang does disclose receiving a desired signal (the information signal) and an interfering signal (noise signal), receiving a interfering signal (noise signal) and subtracting the signals to recover the desired signal. It would have been obvious for one of ordinary skill in the art at the time of the invention to utilize this method of cancellation in any application that required the elimination of interfering signals to allow for the recovery of the desired signal.

Chang does not disclose digitizing the received signals prior to the cancellation step. It would have been obvious for one of ordinary skill in the art at the time of the invention to digitize the received signals. The digitized signals are much easier to store. The stored data will

provide a reference and allow the received data to be monitored at a later data to ensure proper reception had occurred.

Interference cancellation in Chang and the claimed invention take place at baseband. A demodulator is necessary in the claimed invention to get the received signal down to baseband. In Chang, it is not. The received signal of Chang is already at baseband. It would have been obvious for one of ordinary skill in the art at the time of the invention to use components available to ensure the input signal is a baseband signal when interference cancellation is to take place so the interference canceler will operate properly. A demodulator is one of those elements.

Regarding claim 42, Chang further discloses converting the received signals into a corresponding voltage (figure 1 items 5 and 6). Chang does not disclose converting the received signals into a corresponding electrical current. However, it would have been obvious for one of ordinary skill in the art at the time of the invention to convert the received signals into a corresponding electrical current. By converting the signals into electrical current, only a minimal loss of signal strength would occur to the signal while traveling along the electrical conducting cable link as compared to a greater loss in voltage form do to the resistance of the wire.

Regarding claims 44 and 45, Chang further discloses the microphones are coupled to the adaptive filters by and electrical conducting means (figure 2).

Regarding claim 46, Chang discloses the two microphones can be arranged on a pilot's face mask (column 5 lines 17-29).

Regarding claims 47-49, 52, 53, 63 and 64, Chang discloses the receivers are synchronized (column 4 lines 44-56). It is inherent that clock signals must be transmitted to each of the receivers to maintain this synchronization.

Regarding claims 50 and 51, Chang does not disclose the use of a plurality of microphones to receive the voice data and noise signals. However, it would have been obvious for one of ordinary skill in the art at the time of the invention to use a plurality of microphones to receive the voice data and noise signals. With more than one microphone, it is possible to receive a plurality of voice signals from more than one source and after the noise signal has been removed and with proper filtering, all of the voice signals can be recovered.

Claims 57-62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang (US 4,912,767) in view of the instant applications admitted prior art.

Regarding claims 57-62, Chang discloses a system for suppressing noise signals from a signal containing both voice data and noise signals as stated in paragraph 3. Chang further discloses adaptive filtering is conducted to recover an audible signal (figure 2). However, Chang does not disclose which adaptive algorithm is used. "The two most common classes of adaptive filter algorithms are Stochastic Gradient based algorithms and Least-square based algorithms" page 16 lines 21-23 of the instant application. It would have been obvious for one of ordinary skill in the art to use the most common types of adaptive algorithms in the adaptive filtering conducted by Chang since these types of algorithms are the most widely used.

Claims 40-53, 63 and 64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mesecher et al (US 6,289,004).

Regarding claims 40, 43-46, Mesecher discloses a system for suppressing interference signals from a desired signal. A first RF receiver receives a signal such that the only large signal received by the auxiliary antenna is the signal from the interferer (column 3, line 65 to column 4, line 2). The main antenna receives the desired signal and a noise component of the interferer. Both antennas are located in the same apparatus as shown in figure 3B. The interferer signal is subtracted from the signal of the main antenna thereby deriving a signal substantially free from the interference source (column 4, lines 25-29). Figure 12 shows the received signal are input to RF receivers. The RF receivers will demodulate the data before inputting the signals to the interference canceler (column 9, lines 61-67). In addition, the received signals are required to be synchronized before subtraction can take place (column 10, lines 8-10). The result of the subtraction is processed and stored in the modem shown in figure 5.

Mesecher does not disclose the received signals are digitized prior to the subtraction taking place. In figure 5, Mesecher shows the subtraction takes place then the signal is converted to a digital signal. The signal must be converted to a digital signal before being input to the modem for processing and for final transmission. It would have been obvious for one of ordinary skill in the art at the time of the invention to digitize the signal at any point prior to being input to the modem so the signal would be in proper format for the processing and storage in the modem to take place as well as simplifying the circuitry required for the subtraction to take place in the interference canceler.

Regarding claims 41 and 42, Mesecher further discloses converting the received signals into a corresponding voltage (figure 12). Mesecher does not disclose converting the received signals into a corresponding electrical current. However, it would have been obvious for one of ordinary skill in the art at the time of the invention to convert the received signals into a corresponding electrical current. By converting the signals into electrical current, only a minimal loss of signal strength would occur to the signal while traveling along the electrical conducting cable link as compared to a greater loss in voltage form do to the resistance of the wire.

Regarding claims 47-49, 52, 53, 63 and 64, Mesecher discloses the receivers are synchronized (column 10, lines 8-10). It is inherent that clock signals must be transmitted to each of the receivers to maintain this synchronization.

Regarding claims 50 and 51, Mesecher discloses in figure 3B the auxiliary antenna is capable of receiving numerous signals from the interferer to receive the most accurate representation of the interferer signal. The same principle can be used for the main antenna.

Claims 57-62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mesecher et al (US 6.289.004) in view of the instant applications admitted prior art.

Regarding claims 57-62, Mesecher discloses a system for suppressing noise signals from a signal containing both a desired data signal and noise signals as stated above. Mesecher further discloses adaptive filtering means is conducted to recover the desired data signal (figure 12). However, Mesecher does not disclose how this calculation is computed. "The two most common classes of adaptive filter algorithms are Stochastic Gradient based algorithms and Least-square

based algorithms" page 16 lines 21-23 of the instant application. It would have been obvious for one of ordinary skill in the art to use the most common types of adaptive algorithms in the adaptive filtering conducted by Mesecher since these types of algorithms are the most widely used.

(11) Response to Argument

A. Introduction

Prior to responding to the arguments, the examiner would like to describe the field of the invention which is the same for the application and the Clough reference.

In communication systems, the signal to noise ratio present in the system is of vital importance. When large amounts of undesired signals, interference or other noise types are present, a desired signal will be effected and errors will be occur in the reception of the desired signal in the receiver. The goal of communication systems is to eliminate this noise and interference from a desired signal and create an exact replica of a transmitted signal at the receiver.

B. Description of the Clough reference

Clough et al discloses a communication system for canceling unwanted or interfering signals from desired signals. Clough discloses receiving the desired signal together

with the interferring signal (column 1, lines 16-17) and a second receiving element receiving the interferring signal with none or substantially none of the desired signal (column 1, lines 19-21). The signals are digitized (figure 1, items 5 and 6) and a high level of correlation of the noise components between the receivers is present (column 4, lines 1-4). A subtraction takes place (column 8, lines 12-17) at baseband since the signals are acoustic, which eliminates or substantially eliminates the interfering signals from the desired signal. Therefore, the receiver will recover the original desired signal.

C. Response to arguments

The examiner discusses the claims in the same order as the applicant.

Appellant states, on page 21, first paragraph, "As to claims 40-56, 63 and 64, Clough does not demodulate the incoming signals, Neither does he synchronize them.. Neither of these operations is shown or described or implied in Clough. The examiner is not permitted to put words in the mouth of patents. Where that allowed, only one patent would have ever been issued from the U.S. patent Office and it would thereafter 'impliedly' anticipate or obviate all othe inventions thereto." The term synchronized is not stated in the reference. However, the function of synchronizing the two signals is disclosed. As stated in the previous rejection, the noise components of the signals are correlated (column 4, lines 1-5) so they occur at the same time. The definition of "synchronize" according to Merriam Webster's Collegiate Dictionary,

tenth addition, is "to happen at the same time." Therefore, the noise components of the signals are synchronized. Appellant also states Clough does not disclose demodulate the incoming signals. Appellant is correct. However, the previous office action has addressed this fact. The office action states "Interference cancellation in Clough and the claimed invention take place at baseband. A demodulator is necessary in the claimed invention to get the received signal down to baseband. In Clough, it is not. The received signal of Clough is already at baseband. It would have been obvious for one of ordinary skill in the art at the time of the invention to use components available to ensure the input signal is a baseband signal when interference cancellation is to take place so the interference canceler will operate properly. A demodulator is one of those elements. "

Appellant states, in page 21, "In paragraph 3 of the last Office Action, the examiner states" Clough also states in column 7, lines 48-52, the signals are sampled at the same constant discrete time intervals in each A/D converter. The A/D converters are synchronized, then the receivers are synchronized." This is not correct. The Examiner stated this information in paragraph 6, on page 5 of an office action mailed 10/11/2001. This statement was removed and is not found in the subsequent office actions. Appellant further states on page 22, "The examiner makes the following statement in his Office Action: 'The A/D converter is a component of each of the receivers. If the A/D converters are synchronized, then the receivers are synchronized.' In the fist place, there is no disclosure, implication, or suggestion that Clough's A/D converters are synchronized. The word 'synchronization, as well as the word k"demodulation' does not appear in Clough. Again, this is sheer fantasy, in the second place, implying that if one component is

synchronized than another domponent is cynchronized is simply ludicrous. Clearly no patent examiner would allow this short of twisted logic to be used in support for any claim in a patent. Likewise, no such twisted logic should be allowed as a basis for the rejection of a claim." Again, this is incorrect. The Examiner stated this information in paragraph 6, on page 5 of an office action mailed 10/11/2001. This statement was removed and is not found in the subsequent office actions. The steps of synchronizing and demodulating are explained in the above paragraph of this answer.

Appellant states, in the last paragraph of page 22 and page 23, "The examiner has 'divined that Clough involves digitization and synchronization yet nothing is shown, in the specification of in the drawings, to support this argument." Clough discloses the incoming input signals are converted to a digital signal in the A/D converts, items 5 and 6. Clough also discloses the receivers are synchronized as stated in the above paragraphs. The Appellant continues "However, whatever basis the examiner uses, to argue that, where not shown, Clough reveals digitization and demodulation, and Applicant must amend his drawings to actually show such action, supports that argument that the examiner is grasping at straws."Clough discloses the incoming input signals are converted to a digital signal in the A/D converts, items 5 and 6. Appellant is correct in that Clough does not disclose demodulating the received signals. However, the previous office action has addressed this fact. The office action states "Interference cancellation in Clough and the claimed invention take place at baseband. A demodulator is necessary in the claimed invention to get the received signal down to baseband. In Clough, it is not. The received signal of Clough is already at baseband. It would have been obvious for one of

ordinary skill in the art at the time of the invention to use components available to ensure the input signal is a baseband signal when interference cancellation is to take place so the interference canceler will operate properly. A demodulator is one of those elements. "

Appellant states, on page 23, first full paragraph, "As to the argument about synchronization being based upon two things showing up at the same time, Applicant's counsel enters his office at 7:30 a.m. each morning during the week just as Applicant's secretary also enters his office. The office does not open until 8:00 a.m. Applicant is not married to of live with his secretary. Neither Applicant's counsel nor Applicant's secretary has ever discussed the 'synchronization' of there arrivals. The examiner is thus making an argument based on perception but not based on common sense." Appelant continues on page 23, "First, the examiner said the noise components were 'synchronized'. Now he says they are correlated. Correlation is different from synchronization and one does not imply the other. More shocking is the examiner's use of the word 'subtractor in his reference to item 12 of Clough. The inventors in Clough defined item 12 as '...a summing circuit...' (Col. 3, line 29 and (col. 7, line 14). Nowhere in the entire Clough patent is there a 'subtractor 12' or any item termed subtractor." As stated in the previous office action on page 3, first full paragraph, "The examiner, respectfully disagrees. In column 8, lines, 12 and 13, Clough states 'Apparatus according to claim 5, and comprising means (12) for subtracting computed signal samples...'. Clough clearly discloses a subtractor 12." The office action also states, on page 8, paragraph 5, "The receivers are synchronized to one another since the two signals being obtained have the noise components being correlated (column 4 lines 1-5). The definition of synchronization is having events occur at the same time. These

noise components are correlated so they occur at the same time. This allows the subtractor 12 and an adaptive filtering means to suppress the noise signals in order to extract the voice data (figure 1 and column 3 lines 31-45 and 53-57) and to yield an output signal having an enhanced signal to noise ratio (column 7, lines 53-57)."

Appelant states the examiner misses the point of Applicant's invention on page 23 last paragraph. The previous office action states on page 3, last paragraph, "According to the McGraw Hill Dictionary of Scientific and Technical Terms, Second Edition, the acoustic spectrum range is approximately zero to at least 1 megahertz. Acoustics is the science of the production, transmission and effects of sound. The RF range of frequencies is roughly from 10 kilohertz to 100 gigahertz. The frequency ranges overlap and, therefore, the acoustic receivers are capable of receiving certain RF transmissions."

In reference to claims 57-62, Appelant states "the fact of the matter is that Clough is not relevant to the rejections under 35 U.S.C. 103(a) and, therefore, the rejections based on Clough and the allegedly prior art must fail." The examiner disagrees for the reasons stated above and in the previous office actions.

In summary, Appelant has stated "Clough does not mention synchronization, summing circuit 12 is really a subtractor 12, has not definition of what is 'close to the mouth', does not disclose receiving radiated emissions, is already at baseline, does not disclose converting the received signal to a corresponding electrical voltage, has an inherent clock and does not disclose a plurality of microphones." Synchronization has been discussed above. The subtractor 12 is disclosed in column 8, lines 12-17 of Clough. Clough discloses, in column 2,

lines 28-35, "because of the characteristics of such microphones, their response to speech reduces rapidly with distance so that speech will not be received by such a microphone which is spaced only a small distance from the source of the speech." Therefore the microphone receiving the speech must be closer than this distance. Voice signals are already at baseband. It is unclear what is meant by "baseline". The received signals are digitized and digital signals have some voltage value dependent on their value. The A/D converts must have a clock signal input to determine their sampling rate. The clock signal is inherent. Clough discloses, in the first sentence of the abstract, "A noise cancelling system comprising two conventional noise cancelling microphones (1,2)...".

A. Introduction

Prior to responding to the arguments, the examiner would like to describe the field of the invention which is the same for the application and the Chang reference.

In communication systems, the signal to noise ratio present in the system is of vital importance. When large amounts of undesired signals, interference or other noise types are present, a desired signal will be effected and errors will be occur in the reception of the desired signal in the receiver. The goal of communication systems is to eliminate this noise and interference from a desired signal and create an exact replica of a transmitted signal at the receiver.

B. Description of the Chang reference

Chang discloses a communication system for cancelling unwanted or interferring signals from desired signals. Chang discloses receiving the desired signal togther with the interferring signal (abstract) and a second receiving element receiving the interferring signal with none or substantially none of the desired signal (abstract). A high level of correlation of the noise components between the receivers is present (column 4, lines 44-56). A subtraction takes place (figure 2 and column 4, lines 51-56) at baseband since the signals are acoustic, which eliminates or sustantially eliminates the interfering signals from the desired signal. Therefore, the receiver will recover the original desired signal.

C. Response to arguments

The examiner discusses the claims in the same order as the applicant.

The Appelant discloses, on page 29, last full paragraph, "The examiner fails to understand, again, that just because two receivers receive the same signal, they are not synchronized unless it is said that they are synchronized. In addition, neither the words 'synchronize' or demodulate' appear anywhere in Chang. Chang has no relevance to Applicant's application." The examiner, respectfully, disagrees. As stated in the previous office action, page 4, dated 8/27/2002, "The term synchronized is not stated in the reference. However, the function

of synchronizing the two signals is disclosed. As stated in the previous rejection, the noise components of the signals are correlated (column 4, lines 1-5) so they occur at the same time. The definition of "synchronize" according to Merriam Webster's Collegiate Dictionary, tenth addition, is "to happen at the same time." A copy of this reference and the definitions it provides is available upon request.. The discussion about the act of demodulating is discussed on pages 4-5 and 8-9 of the previous office action... As to the statement Chang has no relevance to Applicant's invention, the examiner, respectfully disagrees. Please see the rejections of the claims under 35 U.S.C. 103(a) as being unpatentable over Chang stated in the previous office action."

The Appelant states on page 31, first paragraph, "Chang does not contain a written description in full, clear, concise, and exact terms. It is a joke as a patent. It has no drawing numbers with which to explain the invention. It does not use the word 'synchronization' or the word demodulate' anywhere in the Abstract, Specification or the Claims yet the examiner insists Chang is an invetion using synchronization." The examiner disagrees. Chang (US 4,912,767) is an issue United States Patent and satisfies the criteria for the rejections of the claims under 35 U.S.C. 103(a). The discussion as to synchronization and demodulation is stated in the above paragraph.

The Appelant continues on page 31, stating the references Clough and Chang do not disclose elements of boxes in the figures indicating a means to digitize and to demodulate. As stated previously, Clough discloses A/D converters in figure 1, items 5 and 6. The step of demodulating is not disclosed in the Clough reference but statements concerning this limitation

have been stated above. The demodulation and digitization steps are not disclosed in Change. However, the previous office action recites, on page 13, second and third paragraphs, "Chang does not disclose digitizing the received signals prior to the cancellation step. It would have been obvious for one of ordinary skill in the art at the time of the invention to digitize the received signals. The digitized signals are much easier to store. The stored data will provide a reference and allow the received data to be monitored at a later data to ensure proper reception had occurred.

Interference cancellation in Chang and the claimed invention take place at baseband. A demodulator is necessary in the claimed invention to get the received signal down to baseband. In Chang, it is not. The received signal of Chang is already at baseband. It would have been obvious for one of ordinary skill in the art at the time of the invention to use components available to ensure the input signal is a baseband signal when interference cancellation is to take place so the interference canceler will operate properly. A demodulator is one of those elements."

The Appelant also, states Chang does not disclose "converting the signals to a corresponding voltage or current". When a signal is received in a receiver, as is shown in figure 2 of Chang, the signal is represented by a voltage or current on the wires which are input to the narrowband filters 1-15. This allows the received signal to be processed. Every receiver converts a received signal to a voltage or current.

Appellant states in pages 31 and 32, "Accordingly, since Chang does not disclose receiving radiated emissions, does not disclose digitizing the received signal, does not show a demodulator, does not disclose converting the received signals into a corresponding current, does

not disclose use of a plurality of microphones, and does not disclose an adaptive algorithm, it, like Clough, is not relevant to Applicant's claimed invention the rejections should not stand." The previous office action discloses, on page 13, first paragraph, "Although Chang does not discloses receiving radiated emissions and ambient signals, Chang does disclose receiving a desired signal (the information signal) and an interfering signal (noise signal), receiving a interfering signal (noise signal) and subtracting the signals to recover the desired signal. It would have been obvious for one of ordinary skill in the art at the time of the invention to utilize this method of cancellation in any application that required the elimination of interfering signals to allow for the recovery of the desired signal." Digitizing and demodulating has been discussed above. Converting the received signals into corresponding electrical current has been discussed above. Chang discloses a plurality of microphones in the abstract and discloses the algorithm for eliminating the interference components of the signal is done in the subtractors.

In reference to claims 57-62, Appellant states "the fact of the matter is that Chang is not relevant to the rejections under 35 U.S.C. 103(a) and, therefore, the rejections based on Chang and the allegedly prior art must fail." The examiner disagrees for the reasons stated above and in the previous office actions.

A. Introduction

Prior to responding to the arguments, the examiner would like to describe the field of the invention which is the same for the application and the Mesecher reference.

In communication systems, the signal to noise ratio present in the system is of vital importance. When large amounts of undesired signals, interference or other noise types are present, a desired signal will be effected and errors will be occur in the reception of the desired signal in the receiver. The goal of communication systems is to eliminate this noise and interference from a desired signal and create an exact replica of a transmitted signal at the receiver.

B. Description of the Mesecher reference

Mesecher discloses a communication system for canceling unwanted or interfering ambient signals from desired RF signals. Mesecher discloses receiving the desired RF signal in a main antenna together with the interfering ambient signal and a second receiving element receiving the interfering signal with none or substantially none of the desired signal (column 3, line 65 to column 4, line 2). Figure 12 discloses the signals are input into RF receivers. The RF receivers will demodulate the signals to base band (column 9, lines 61-67) so interference cancellation can take place via subtraction (column 9, lines 65-67 and figure 12). The interference free signals is processed and stored in the modem 45 of figure 5.

C. Response to arguments

The examiner discusses the claims in the same order as the applicant.

Appellant states "Mesecher is directed to the cancellation of one or more 'known' or 'fixed' ambient signals (col. 1, lines 7-13, that is the patent requires that the direction of arrival of the ambient signals are fixed and do not change." The examiner agrees that Mesecher discloses an adaptive cancellation of fixed interferers.

Appellant states on page 36, "the examiner has not shown Mesecher will work if the incoming signals are digitized prior to the subtraction taking place." The examiner has stated in the previous office action, dated 8/27/2002, on page 16 last paragraph, "Mesecher does not disclose the received signals are digitized prior to the subtraction taking place. In figure 5, Mesecher shows the subtraction takes place then the signal is converted to a digital signal. The signal must be converted to a digital signal before being input to the modem for processing and for final transmission. It would have been obvious for one of ordinary skill in the art at the time of the invention to digitize the signal at any point prior to being input to the modem so the signal would be in proper format for the processing and storage in the modem to take place as well as simplifying the circuitry required for the subtraction to take place in the interference canceler." The examiner believes this shows Mesecher will work if the incoming signals are digitized prior to subtraction taking place.

(12) Conclusion

Appellant has submitted evidence of non-obviousness. This evidence has been considered.

Appellant further stated on pages 38 and 39, "The statement, 'it would have been obvious to one skilled in the art to .....' is not applicable in this case because (1) neither Clough, Chang or Mesecher discloses the invention, (2) Clough, Chang and Mesecher do not disclose they receive radiated emissions, (3) Clough, Chang and Mesecher do not digitize the incoming signals, (4) Clough, Chang and Mesecher do not synchronize the incoming signals, (5) Clough and Chang do not disclose the use of two microphones, (6) and Chang does not teach any invention because it does not comply with the minimum requirements under 35 U.S.C. 112." The above statement is applicable because the previous office actions disclosing the rejections of the pending claims and the discussions above have:

(1) disclosed how the rejections of claims 40-64 as being unpatentable over Clough, Chang and Mesecher disclose the claim limitations;

(2) Mesecher discloses receiving RF signals and Clough and Chang disclose receiving a desired signal (the information signal) and an interfering signal (noise signal), receiving a interfering signal (noise signal) and subtracting the signals to recover the desired signal. It would have been obvious for one of ordinary skill in the art at the time of the invention to utilize this method of cancellation in any application that required the elimination of interfering signals to allow for the recovery of the desired signal.

(3) Clough discloses digitizing the incoming signal (figure 1, A/D converters 5 and 6), though Chang does not disclose digitizing the received signals prior to the cancellation step. It would have been obvious for one of ordinary skill in the art at the time of the invention to digitize the received signals. The digitized signals are much easier to store. The stored data will

provide a reference and allow the received data to be monitored at a later data to ensure proper reception had occurred. Mesecher does not disclose the received signals are digitized prior to the subtraction taking place. In figure 5, Mesecher shows the subtraction takes place then the signal is converted to a digital signal. The signal must be converted to a digital signal before being input to the modem for processing and for final transmission. It would have been obvious for one of ordinary skill in the art at the time of the invention to digitize the signal at any point prior to being input to the modem so the signal would be in proper format for the processing and storage in the modem to take place as well as simplifying the circuitry required for the subtraction to take place in the interference canceler.

(4) Clough and Chang disclose correlating noise components of the signals and therefore, synchronizing the received signals. Mesecher discloses, in column 10, lines 8-10, "the alternative embodiment shown in FIGS 10-13 require synchronization of the received signals before subtraction can be made."

(5) Clough discloses "A noise canceling system comprises two conventional noise canceling microphones (1,2)" in the abstract and Chang discloses "two sensors are located so that the first sensor will detect both voice signals and noise signals, and a second sensor will detect only noise signals." in the abstract.

(6) Chang (US 4,912,767) is an United States Patent issued march 27, 1990 and therefore qualifies as a prior art reference.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Kevin M. Burd

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January 22, 2003

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